What is claimed is:

1. A method comprising:

directing light onto components of an optical assembly in which a first component includes a first pattern of marks with a first frequency and a second component includes a second pattern of marks with a second different frequency;

detecting an optical signal corresponding to a superposition of the first and second patterns; and

determining whether the first and second components are properly positioned with respect to one another based on the detected optical signal.

2. The method of claim 1 wherein the optical signal has a beat frequency that is based on the first and second frequencies.

3. The method of claim 1 including:

comparing a pattern corresponding to the detected optical signal to a reference pattern of marks; and

determining whether the first and second components are properly positioned with respect to one another based on the comparison.

4. The method of claim 1 including:

directing light onto a reference pattern of marks in one of the components, the reference pattern of marks corresponding to a superposition of the first and second patterns;

detecting a second optical signal based on the reference pattern of marks in the component; and

determining whether the first and second components are properly positioned with respect to one another based on the detected optical signals.

5. The method of claim 1 including determining an amount of misalignment between the first and second components.

6. The method of claim 5 including adjusting a relative position of the first and second components to correct for the misalignment.

7. The method of claim 1 including fixing the position of the first and second components with respect to one another.

8. The method of claim 1 including flipping the first component onto the second component and subsequently directing light onto the components, detecting the optical signal corresponding to the superposition of the first and second patterns of marks, and determining whether the first and second components are properly positioned with respect to one another based on the detected optical signal.

9. The method of claim 1 wherein the first component comprises a laser diode chip and the second component comprises a light guiding circuit.

10. The method of claim 1 including detecting a misalignment between the first and second components on the order of less than 0.5 micron.

11. The method of claim 10 wherein the light includes a wavelength that is not absorbed by the first and second components when the light is directed onto the assembly.

12. The method of claim 1 wherein the first and second patterns of marks comprise digital marks.

13. The method of claim 1 wherein the first pattern of marks has approximately a fifty percent duty cycle.

14. A method comprising:

providing a bottom cladding layer on a substrate;

providing a core layer over the bottom cladding layer;

defining, by a single mask process, part of the core layer for an optical waveguide and part of the core layer for a template for a first pattern of marks, the first pattern of marks having a first frequency;

providing a top cladding layer over the part of the core layer defining the optical waveguide;

etching the core layer and the bottom cladding layer to form the first pattern of marks, defined by the template, in the bottom cladding layer;

positioning a semiconductor chip that includes a second pattern of marks so that the second pattern of marks overlies the first pattern of marks, the second pattern of marks having a second frequency;

directing light onto the first and second patterns;

detecting a first optical signal, the first optical signal having a beat frequency based on a superposition of the first and second patterns of marks; and

determining whether the semiconductor chip is properly positioned based on the detected optical signal.

15. The method of claim 14 including:

defining, by said mask process, part of the core layer for a template for a reference pattern of marks, the reference pattern corresponding to a superposition of the first and second patterns of marks; and

forming the reference pattern of marks, defined by the template for the reference pattern, in the bottom cladding layer.

16. The method of claim 15 including :

directing light onto the reference pattern of marks;

detecting a second optical signal based on the reference pattern of marks; and

determining whether the semiconductor chip is properly positioned with respect to the waveguide based on the first and second detected optical signals.

17. The method of claim 14 wherein the first and second patterns of marks comprise digital marks.

18. The method of claim 17 wherein the first pattern of marks has approximately a fifty percent duty cycle.

19. The method of claim 14 including fixing the semiconductor chip in place with respect to the optical waveguide.

20. An apparatus comprising:

an optical assembly comprising first and second components, wherein the first component includes a first pattern of marks having a first frequency, and the second component includes a second pattern of marks having a second frequency different from the first frequency, wherein the first and second components are positioned relative to one another such that one of the patterns of marks lies above the other pattern of marks.

21. The apparatus of claim 20 wherein the first component further includes a third pattern of marks, the third pattern corresponding to a superposition of the first and second patterns of marks.

22. The apparatus of claim 20 wherein the first component includes a waveguide structure and the second component includes a photonic device.

23. The apparatus of claim 22 wherein the second component includes a flip-chip, and wherein the photonic device is substantially aligned with a core of the waveguide structure.

24. The apparatus of claim 20 wherein the first component comprises an optical waveguide structure including:

a substrate;

a bottom cladding layer on the substrate;

an optical waveguide core on the bottom cladding layer; and

an upper cladding layer over the waveguide core,

the first pattern of marks being defined in the bottom cladding layer.

25. The apparatus of claim 20 wherein the first pattern of marks has approximately a fifty percent duty cycle.